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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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06/08/2004

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EXAMINER

PAREKH, NITIN

ART UNIT

PAPER NUMBER

2811

DATE MAILED: 06/08/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/548,946

Applicant(s)

ESTACIO ET AL.

Examiner

Nitin Parekh

Art Unit

2811

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 22 March 2004.
- 2a) ☒ This action is FINAL. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 5-14 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 5-14 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 04-13-2000 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claim 13 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

The limitations as recited in claim 13, line 1, include: "apertures in the leadframe".

However, the description in the specification (see pages 2-5) does not include the leadframe having apertures.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 5, 6, 8 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Williams et al. (US Pat. 6307755) in view of Temple et al (US Pat. 5103290).

Regarding claim 5, Williams et al. disclose a leadframe/MOSFET chip device comprising:

- a lead frame having three terminals/source-gate-drain terminals/connections having source/gate section/rail and drain section/rail (502 and 500 respectively in Fig. 20A; Col. 19, line 63- Col. 20, line 5), the package comprising wireless connections
- a die (510 in Fig. 20A) having source/gate connections/terminals on a top side (not numerically referenced in Fig. 20A) corresponding to those on the lead frame (Col. 20, lines 1-5) being bonded to the respective lead frame section/rail (502 in Fig. 20A) to provide electrical connections between the top side of the die and the respective lead frame section/rail, and
- the lead section/rail having the drain connection (500 in Fig. 20A) being bonded to the backside of the die to provide electrical connections to the respective drain connection

(Fig. 20A; Col. 19, line 40- Col. 20, line 5).

Williams et al. fail to:

a) explicitly show in Fig. 20A, the die being bumped and having solder bumps, and

b) teach a copper clip being on the backside of the die such that the copper clip couples the drain regions of the bumped die and the lead rail.

a) Williams et al. further teach prior art and another embodiments comprising the dice having conventional flip chip die attachment comprising bumps (Col. 12, lines 25-30) including the embodiment (see Fig. 16C) comprising a die having bumps on a top side of the die (see 342 in Fig. 16C; Col. 17, line 10).

Temple et al. teach using a die having solder bump connections (30/44 in Fig. 2-7; Col. 5, line 38- Col. 7, line 3).

b) Williams et al. teach the prior art configuration (Fig. 19A and 19F-H) where a copper strap/clip having a V-shape/U-shape bend/groove (see 460 in Fig. 19H) is attached to a second/back side of a die (462 in Fig. 19H) using an epoxy (Col. 18, line 66) such that the strap/clip couples the respective connection region of the die and also couples a section/rail of the lead frame (see 470 in Fig. 19H). Such configuration having the copper strap/clip-die assembly and subsequent connection with the lead rail is used to avoid coplanarity problems (see 461/470 in Fig. 19H; Col. 18, lines 38-65). Williams et al. further teach using conventional attach material including the conductive epoxy or solder/solder paste to provide the desired connections (Col. 15, line 50).

It would have been obvious to a person of ordinary skill the art at the time invention was made to incorporate the die being bumped having solder bump connections and the copper clip being attached on the backside of the die connecting the drain regions and lead rail as taught by the embodiments in Williams et al. and Temple et al. so that the coplanarity problems can be avoided and the solder joint integrity/bonding strength between the topside of the die and the leadframe can be improved in Williams et al's device.

Regarding claim 6, Williams et al. and Temple et al. teach substantially the entire claimed structure as applied to claim 5 above, wherein Williams et al. further teach using the solder paste to provide the attachment of the die (Col. 15, line 50).

Regarding claim 8, Williams et al. and Temple et al. teach substantially the entire claimed structure as applied to claim 5 above, wherein Williams et al. further teach the bumps having an under bump material/UBM (see 202/203 in Fig. 13A; Col. 12, lines 37-48).

Regarding claim 9, Williams et al. and Temple et al. teach substantially the entire claimed structure as applied to claim 5 above, wherein Williams et al. further teach lead frame including sections/rails comprising conventional material such as copper (Col. 1, line 56; Col. 12, line 53).

5. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Williams et al. (US Pat. 6307755) and Temple et al. ((US Pat. 5103290) as applied to claim 5 above, and further in view of Kalfus et al. (US Pat. 4935803).

Regarding claim 7, Williams et al. and Temple et al. teach substantially the entire claimed structure as applied to claim 5 above, except the lead rail having a V-groove.

Kalfus et al. teach a lead frame assembly (Fig. 5) having a clip/strap including a variety of configurations/shapes of an attachment of clip/strap and the leadframe including the configuration where the lead section/rail has a V-groove (see 50 in Fig. 5) being bonded to respective groove of the clip/strap (60 in Fig. 5) providing an improved bonding and alignment (Col. 4, line 37- Col. 6, line 35).

It would have been obvious to a person of ordinary skill the art at the time invention was made to incorporate the lead rail having a V-groove as taught by Kalfus et al. so that mechanical stress can be reduced and the alignment and bonding strength can be improved in Temple et al. and Williams et al's device.

6. Claims 10-12 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Williams et al. (US Pat. 6307755) in view of Temple et al (US Pat. 5103290) and Kalfus et al. (US Pat. 4935803).

Regarding claim 10, Williams et al. disclose a leadframe/MOSFET chip device comprising:

- a lead frame having three terminals/source-gate-drain terminals/connections having source/gate section/rail and drain section/rail (502 and 500 respectively in Fig. 20A; Col. 19, line 63- Col. 20, line 5), the package comprising wireless connections
- a die (510 in Fig. 20A) having source/gate connections/terminals on a top side (not numerically referenced in Fig. 20A) corresponding to those on the lead frame (Col. 20, lines 1-5) being bonded to the respective lead frame section/rail (502 in Fig. 20A) to provide electrical connections between the top side of the die and the respective lead frame section/rail, and
- the lead section/rail having the drain connection (500 in Fig. 20A) being bonded to the backside of the die to provide electrical connections to the respective drain connection

(Fig. 20A; Col. 19, line 40- Col. 20, line 5).

Williams et al. fail to:

a) explicitly show in Fig. 20A, the die being bumped and having solder bumps, and
b) the lead rail having leads and a v-groove and a copper clip having an edge being attached on the backside of the die such that the copper clip couples such that the edge of the copper clip is in the v-groove of the lead rail and a solder paste couples the edge of the copper clip and the v-groove.

a) Williams et al. further teach prior art and another embodiments comprising the dice having conventional flip chip die attachment comprising bumps (Col. 12, lines 25-30) including the embodiment (see Fig. 16C) comprising a die having bumps on a top side of the die (see 342 in Fig. 16C; Col. 17, line 10).

Temple et al. teach using a die having solder bump connections (30/44 in Fig. 2-7; Col. 5, line 38- Col. 7, line 3).

b) Williams et al. teach the prior art configuration (Fig. 19A and 19F-H) where a copper strap/clip having a V-shape/U-shape bend/groove (see 460 in Fig. 19H) is attached to a second/back side of a die (462 in Fig. 19H) using an epoxy (Col. 18, line 66) such that the strap/clip couples the respective connection region of the die and also couples a section/rail of the lead frame including leads (see 470 in Fig. 19G/19H). Such configuration having the copper strap/clip-die assembly and subsequent connection with the lead rail is used to avoid coplanarity problems (see 461/470 in Fig. 19H; Col. 18,

lines 38-65). Williams et al. further teach using conventional attach material including the conductive epoxy or solder/solder paste to provide the desired connections (Col. 15, line 50).

Kalfus et al. teach a lead frame assembly (Fig. 5) having a clip/strap including a variety of configurations/shapes of an attachment of clip/strap and the leadframe including the configuration where the lead section/rail has a V-groove (see 50 in Fig. 5) being bonded to respective groove of the clip/strap (60 in Fig. 5) using conventional bonding material including solder/solder paste (56 in Fig. 5; Col. 5, lines 45-56) to provide an improved bonding and alignment (Col. 4, line 37- Col. 6, line 35).

It would have been obvious to a person of ordinary skill the art at the time invention was made to incorporate elements a) and b) above as taught by the embodiments in Williams et al., Temple et al. and Kalfus et al. so that the coplanarity problems can be avoided and the solder joint integrity/bonding strength for the assembly can be improved in Williams et al's device.

Regarding claim 11, Williams et al., Temple et al. and Kalfus et al. teach substantially the entire claimed structure as applied to claim 10 above, wherein Williams et al. further teach using the solder paste to provide the attachment of the die (Col. 15, line 50).

Regarding claims 12 and 14, Williams et al., Temple et al. and Kalfus et al. teach substantially the entire claimed structure as applied to claim 10 above, wherein Williams et al. further teach lead frame including sections/rails comprising conventional material such as copper (Col. 1, line 56; Col. 12, line 53).

7. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Williams et al. (US Pat. 6307755), Temple et al (US Pat. 5103290) and Kalfus et al. (US Pat. 4935803) as applied to claim 10 above, and further in view of Ewer (US Pat. 6075286).

Regarding claim 13, Williams et al., Temple et al. and Kalfus et al. teach substantially the entire claimed structure as applied to claim 10 above, except the device comprising apertures in the leadframe.

Ewer teaches a device comprising a conductive leadframe substrate and a clip where the leadframe substrate (see 13/14 in Fig. 4a-6) has apertures/holes (not numerically referenced- see Fig. 4a-6) and bends (16 in Fig. 6) to provide stress relief (Col. 3, line 42- Col. 4, line 10).

It would have been obvious to a person of ordinary skill the art at the time invention was made to incorporate the device comprising the apertures in the leadframe as taught by Ewer so that the thermal stress can be reduced in Temple et al. and Kalfus et al. and Williams et al's device.

Response to Arguments

8. Applicant's arguments filed on 03-22-04 have been fully considered but they are not persuasive.

A. Applicant contends that Williams et al's combination with the prior art would result in decreased conductivity, less structural integrity and increased stress and there is no motivation to combine the prior art.

However, as explained above, the prior art two-piece configuration comprising copper strap/clip-die assembly and subsequent connection with the lead rail is used to avoid coplanarity problems of conventional single piece leadframe-die assembly (see 461/470 in Fig. 19H; Col. 18, lines 38-65). Therefore, the prior art configuration having the copper clip/strap is applied to Williams et al. to avoid the coplanarity related problems and respective soldering defects.

Conclusion

9. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any

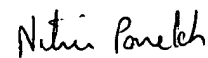
Art Unit: 2811

extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nitin Parekh whose telephone number is 571-272-1663. The examiner can normally be reached on 09:00AM-05:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie Lee can be reached on 571-272-1732. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9318.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.



Nitin Parekh

PATENT EXAMINER

NP

06-03-04

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